CBCT Diagnostic Application in Detection of Mesiobuccal Canal in Maxillary Molars and Distolingual Canal in Mandibular Molars: A Descriptive Study

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Abstract

Objectives: The location of second mesiobuccal root canal (MB2) in maxillary molars is usually very difficult and generally easy to be missed. Frequency of mesiobuccal canal has been investigated by numerous authors using different methods including clinical and laboratory work. The objective of this study is to detect presence of MB2 canal in maxillary molars and distolingual canal in mandibular molars using CBCT and specifically to compare prevalence of presence of MB2 in maxillary molars and distolingual canals in mandibular molars between gender male and female and to compare prevalence of presence of MB2 canal maxillary molars and distolingual canal in mandibular molars between Malay, Chinese and Indians.

Materials and method: A descriptive study is conducted by examining CBCT of all patients in Faculty of Dentistry radiographic records. These patients had undergone scanning for various treatment modalities. Scanning was performed at USIM Dental Clinic between the periods of March 2012 until November 2014. The images had been evaluated by final year dental students. The present, number of MB2 canal in maxillary first permanent molar (FPM) and distolingual canal in mandibular first permanent molar (FPM) will be evaluated and record in a data collection sheet.

Result: In total of 89 patients, 158 teeth were examined consisting of upper and lower first molar. The number of maxillary FPM is 72 and mandibular FPM is 86. The prevalence of MB2 canal in male is 18% and in female is 10%. The prevalence of distolingual canal in male is 20% and in female is 10%. Out of 89 patients, 72 patients are Malay, 12 patients are Chinese and 5 patients are Indian. The presence of MB2 canal in Malay is 15 canals, 5 for Chinese and none were found in Indian patients. The presence of distolingual canal in Malay is 23 canals, Chinese 2 and Indian 1.

Conclusion: The incidence of MB2 canal and distolingual canal show slight difference between male and female. The incidence of MB2 canal and distolingual canal between races cannot be compared due to insufficient data. Since the examination was done by final year dental students, the result obtained was lower compared to the standard value of data provided in previous research.

Keywords: CBCT, Mesiobuccal canal, Maxillary molar, Distolingual canal, Mandibular molar

Introduction

Frequency of mesiobuccal canal has been investigated by numerous authors using different methods including clinical and laboratory work. In vivo clinical studies have included retrospective evaluations of patient records, radiographic assessments, and clinical examinations during endodontic treatment, both with and without the aid of magnification. In vitro laboratory studies have used extracted teeth and have included endodontic access, examination, radiography, scanning electron microscopy, grinding and sectioning, as well as numerous clearing studies using decalcification with India ink and other dyes.

Based on the previous study done by Cleghorn et al. show that the incidence of a second root canal in the mesiobuccal root (MB2) is 56.8%, in the distobuccal root 1.7%, and in the palatal root less than 1%.

Over 95% (95.9%) of maxillary first molars had three roots and 3.9% had two roots. The incidence of fusion of any two or three roots was approximately 5.2%.
Conical and C-shaped roots and canals were rarely found (0.12%) [1].

The incidence of two canals in the mesiobuccal root was 56.8% and of one canal was 43.1% in a weighted average of all reported studies. The incidence of two canals in the mesiobuccal root was higher in laboratory studies (60.5%) compared to clinical studies (54.7%) [1]. The prevalence of the Mesiobuccal Canal 2 (MB2) according to different studies on different races shows that: A total of 180 teeth from Sulaimani population (Iraq) show that 116 teeth (64.4%) had one root canal in mesiobuccal root and the remaining 64 teeth (35.6%) had two root canals [2].

The sub arabian population show that from the total of 352 teeth, 82 teeth (23.3%) had two roots canal and the remaining 270 teeth (76.7%) had one root canal in the mesiobuccal root [3]. The location of the MB2 canal: The incidence of a second root canal in the mesiobuccal root (MB2) is 56.8%, in the distobuccal root 1.7%, and in the palatal root less than 1% [1]. The orifice of the second mesiobuccal root canal was commonly located lingual to the main mesiobuccal (MB) canal orifice [3]. The distance between the MB and MB2 canals is 1-4 mm and the orifice is usually smaller in diameter compared to the main canal [4].

The incidence of a third root was 13% and was strongly correlated with the ethnicity of the studied population. Three canals were present in 61.3%, 4 canals in 35.7% and 5 canals in approximately 1%. Root canal configuration of the mesial root revealed 2 canals in 94.4% and 3 canals in 2.3% [5]. Root canal configuration of the mesial root revealed 2 canals in 94.4% and 3 canals in 2.3%. Distal root of the mandibular molar showed that 116 teeth (64.4%) had one root canal in mesiobuccal root and the remaining 64 teeth (35.6%) had two root canals [2].

In Hong Kong Chinese patients, from 100 mandibular teeth studied, 15% were found to be 3-rooted. 45% displayed 2 distal canals and 28% had 2 separate distal apical foramina [6,8].

**Problem Statement**

Vertucci proposed a standardized method for categorizing known root canal anatomic variations, and a more clinically relevant classification of the root canal anatomy was described by Weine 4 However, there are many individual tooth variations and hence each case should be evaluated separately. Therefore, it is of utmost importance that all the canals are located and treated during the course of endodontic therapy [9]. MB2 canal and distolingual canal were always cause failure in endodontics treatment due to missed canal. There are many researches done to investigate the prevalence of MB2 canal in maxillary molar and distolingual canal in mandibular molar has been published, but the nationality of the studied subject was rarely mentioned. As to date, there is no record on the prevalence of incidence of MB2 canal and distolingual canal between the difference gender and races of Malaysians.

Hence this study was undertaken to detect the presence of MB2 canal and distolingual canal among the patient using CBCT.

**Rationale of Study**

We undertook this new imaging modality to study the variation in anatomy of maxillary and mandibular molars by detecting the prevalence of Mesiobuccal 2 canal and Distolingual canal by using CBCT and record the incidence of the said canals between difference gender and race.

**Objective**

**General Objective**

To detect presence of MB2 canal in first permanent maxillary molars and distolingual canal in first permanent mandibular molars using CBCT.

**Specific Objective**

1. To compare prevalence of presence of MB2 and distolingual canals between gender male and female.
2. To compare prevalence of presence of MB2 canal and distolingual canal between Malay, Chinese and Indians.

**Materials and Methods**

A descriptive study was conducted by examining CBCT of all patients. These patients had undergone scanning for various treatment modalities. Scanning was performed at USIM Dental Clinic between the periods of March 2012 until September 2014. The CT scan machine used is Planmeca ProMax 3d Mid (Table 1).

The images were evaluated by 2 final year dental student. The present, number of MB2 canals in maxillary molar and distolingual canals in mandibular molar was evaluated. The statistical evaluation and the incidence of additional canals were determined. We then further analyze and classify the data according to desired categories (Table 2).

**Result**

In total of 89 patients, 158 teeth were examined consisting of upper and lower first molar. The number of maxillary FPM is 72 and mandibular FPM is 86. The prevalence of MB2 canal in male is 18% and in female is 10%. The prevalence of distolingual canal in male is 20% and in female is 10%. Out of 89 patients, 72 patients are Malay, 12 patients are Chinese and 5 patients are Indian. The presence of MB2 canal in Malay is 15 canals, 5 for Chinese and none were found in Indian patients. The presence of distolingual canal in Malay is 23 canals, Chinese 2 and Indian 1.

**Discussion**

Based on our result, there is a significant difference between

<table>
<thead>
<tr>
<th>Gender</th>
<th>No. of patient</th>
<th>No of teeth</th>
<th>MB2 canal (%)</th>
<th>DL canal (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Male</td>
<td>44</td>
<td>72</td>
<td>13(18%)</td>
<td>17(20%)</td>
</tr>
<tr>
<td>Female</td>
<td>45</td>
<td>86</td>
<td>7(10%)</td>
<td>9(10%)</td>
</tr>
<tr>
<td>Total</td>
<td>158</td>
<td>20(28%)</td>
<td>26(30%)</td>
<td></td>
</tr>
</tbody>
</table>

**Table 1:** Result of prevalence of the canals according to genders.

<table>
<thead>
<tr>
<th>Race</th>
<th>No. of patient</th>
<th>MB2 canal (%)</th>
<th>DL canal (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Malay</td>
<td>72</td>
<td>15(21%)</td>
<td>23(27%)</td>
</tr>
<tr>
<td>Chinese</td>
<td>5</td>
<td>5(7%)</td>
<td>2(2%)</td>
</tr>
<tr>
<td>Indians</td>
<td>12</td>
<td>-</td>
<td>1(1%)</td>
</tr>
<tr>
<td>Total</td>
<td>89</td>
<td>20(28%)</td>
<td>26(30%)</td>
</tr>
</tbody>
</table>

**Table 2:** Result of prevalence of the canals according to races.
the prevalence of the MB2 canal and distolingual canal in different genders male and female. Based on previous study done, males are more likely to exhibit these canals than females [10]. However, this may prove to be an insignificant finding in a study with a higher sample size. One particular limitation in this study was the absence of a second examiner who could reassess each case in which the primary operator had failed to identify a second MB2 canal and DL canal. Therefore, we believe that having a second evaluator may result in reporting of a higher frequency of second MB2 canals and DL canals than this study.

There are many research articles regarding comparison of the prevalence of extra canal between races. Generally, most of the race traits exhibit a significant difference in the occurrence of extra canal, due to the genetic factor. Many researches are available in proving this statement by using different methods, such as CBCT, staining of the canal or magnification loupes [7,11].

The result obtained in our research is inconclusive in comparing the prevalence between 3 different main races in Malaysia which are Malay, Chinese and Indians. This is due to the non-fairly distribution of the patients where Malay is the highest and Chinese is the lowest. The results obtained are 72 Malay, 12 Indians and 5 Chinese where for MB2 canal, 21% are found in Malay patient, 5% in Chinese and none were found in Indians. For distolingual canal, 27% are found in Malay patient, 2% in Chinese and 1% in Indians.

The more common use of operating microscope or loupes in recent clinical studies has resulted in an increased prevalence of the clinical detection of the MB2 canal. A study by Sempira and Hartwell found that the use of an operating microscope did increase the incidence of MB2 [9,12,13].

Conclusion

The incidence of MB2 canal and distolingual canal show slight difference between male and female. The incidence of MB2 canal and distolingual canal between races cannot be compared due to insufficient data. Since the examination was done by final year dental students, the result obtained was lower compared to the standard value of data provided in previous research. Recommendation was given that interpreting CBCT images best examined by experienced dentists and specialists.

References

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